

**Third Semester**  
**Course CT-09 :Computer Networks**  
**UNIT-I**

**Protocol Architecture** :Overview: Communication model, Communication Tasks, Data Communication Networking: WAN, LAN, Wireless Networks. Basics of Network Software: Protocol and protocol architecture, Protocol functions, Design Issues for the layers, interfaces & Services, Connection oriented and connectionless services, service primitives, relationship of services to protocols, ISO REF Models, TCP/IP Model.

**Data Communications:** Data Transmission: Concepts of Frequency, Spectrum, bandwidth, Electromagnetic spectrum and frequencies for data communication, Fourier analysis, Data and signal, Transmission impairments, channel capacity, Nyquist bandwidth, Shannon capacity formula, decibels and signal strength, Transmission media: Coaxial, twisted pair, Comparative study of Categories of cables, Coaxial, Optical Fibers, Wireless transmission: Terrestrial Microwave, satellite, Broadcast Radio, Infrared,.

**UNIT-II**

**Data Encoding:** BCA (NRZ, Bipolar AMI, B8ZS, HDB3, ASK, FSK, PSK, PCM, AM, FM, PM), Spread Spectrum. Asynchronous and Synchronous transmission, Full and Half duplex, Interfacing, Functional and Procedural aspects of V.24,

Data Link Control: Flow control: Stop and Wait, Sliding window, Error detection: Parity Check, CRC. Error control: Stop and Wait ARQ, Go back-N ARQ, Selective-Reject ARQ, Brief idea of HDLC and other Data Link control protocols

**UNIT-III**

**Circuit Switching:** Simple switching Network, Circuit Switching Networks, Circuit Switching Concepts: Space Division switching, Time Division Multiplexing, Routing in circuit switching Networks, Control Signalling, Inchannel & common channel signaling, Brief idea of SS7. Packet Switching: Packet switching principles, Routing, X.25

**UNIT-IV**

**LAN Technology:** LAN architecture, IEEE 802 standards, Ethernet (CSMA/CD): Medium Access Control, 10, 100, Gigabit Ethernet. Brief survey of other LAN systems (Token ring, FDDI, ATM, Fiber channel). Wireless LANs, Bridges, Latest trends in LAN technologies  
LAN Devices: Study of specifications of L2 and L3 switches, Structured cabling, Passive components.

**UNIT-V**

Principles of Internetworking, connection less Internetworking, IP, IPv6, IP multicasting. Routing protocols, TCP, UDP, SNMP, SMTP and MIME, HTTP

**Recommended Books :**

1. William Stallings: Data & Communications, Sixth Edition
2. A. S. Tanenbaum : Computer Networks

## Course CT10: JAVA Programming

### UNIT-I

**Introduction to Java:** Bytecode, features of Java, data types, variables and arrays, operators, control statements.

**Objects & Classes:** Object Oriented Programming, defining classes, static fields and methods, object construction

### UNIT-II

**Inheritance:** Basics, using super, method overriding, using abstract classes, using final with inheritance.

**Packages and Interfaces:** Defining a package, importing package, defining an interface, implementing and applying interfaces.

### UNIT-III

**Exception Handling:** Fundamentals, exception types, using try and catch.

**Multithreaded Programming:** Creating a single and multiple threads, thread priorities, synchronization.

### UNIT-IV

**Applets:** Applets basics, applets architecture, applets skeleton, the html applet tag, passing parameters in applets.

**Event Handling:** Event classes and event listener interfaces.

### UNIT-V

Graphic Programming Introduction to swings.

#### Recommended Books :

1. P. Naughton and H. Schildt: The complete reference to Java, Tata Mc-Graw Hill.
2. Deitel and Dietel: How to program in Java

## **Course ET-01A :Introduction to Data Science**

### **UNIT-1**

*Data Manipulation at Scale* Databases and the relational algebra, Parallel databases, parallel query processing, in-database analytics

MapReduce, Hadoop, relationship to databases, algorithms, extensions, languages  
Key-value stores and NoSQL; tradeoffs of SQL and NoSQL

### **UNIT-II**

*Analytics* Topics in statistical modeling: basic concepts, experiment design, pitfalls  
Topics in machine learning: supervised learning (rules, trees, forests, nearest neighbor, regression), optimization (gradient descent and variants), unsupervised learning

### **UNIT-III**

*Communicating Results*

Visualization, data products, visual data analytics, Provenance, privacy, ethics, governance

### **UNIT-IV**

*Special Topics*

Graph Analytics: structure, traversals, analytics, PageRank, community detection, recursive queries, semantic web

### **Unit-V**

Review of Basic Data Analytic Methods Using R 63

Introduction to R,, R Graphical User Interfaces, Data Import and Export , Attribute and Data Types, Descriptive Statistics, Exploratory Data Analysis, Visualization Before Analysis , Dirty Data , Visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation , Statistical Methods for Evaluation, Hypothesis Testing, Difference of Means, Wilcoxon Rank-Sum Test, Type I and Type II Errors , Power and Sample Size , ANOVA

## Course ET-01B :Computer Graphics

### UNIT-1

**Geometry and Line generation:** Lines, Line segments and perpendicular lines, distance between a point and a line, vectors, pixels, frame buffers, vector generation, Bresenham's algorithm, anti-aliasing of line, thick line segments, character generation, display the frame buffer.

**Graphics Primitives:** Display devices, primitive operations, Display file interpreter, Normalized device co-ordinates, Display file structure and display file algorithms, Display control, text, Line style primitives.

### UNIT-2

**Polygons:** Polygon representation, Entering polygons, Polygon interfacing algorithms, filling polygons, filling with a pattern, Initialization, Antialiasing.

**Segments:** Creation of segment, Closing, deletion and renaming segments, visibility, image transformations, saving and showing segments.

### UNIT-3

**2D and 3D Transformations:** Matrices, Scaling transformations, Rotation, Homogeneous co-ordinates and Translations, Co-ordinate transformations, Rotation about an arbitrary point, Inverse transformations, Transformation routines, Transformation and patterns, Initialization, Display procedures. 3D geometry, 3D primitives and transformations.

### UNIT-4

**Windowing and Clipping:** The viewing transformation and its implementation, Clipping, Cohen Sutherland Outcode algorithm, Clipping of polygons, generalized clipping, Multiple windowing, Parallel projection, Viewing projections and special projections, Conversion to view plane co-ordinates, Clipping in three dimensions, Clipping planes.

### UNIT-5

**Hidden surfaces and Lines:** Back-face algorithm, Z-buffers, Scan line algorithm, Franklin algorithm, Illumination, Transparency, Reflection, Shadows, Ray tracing, halftones, Color Models

#### Text/Recommended Books:

1. Steven Harrington:- Computer Graphics: A programming Approach

## Course ET-02A :Software Engineering

### Unit I

**Software Engineering Fundamentals:** Definition of Software, Software characteristics, Software Applications.

**Software Process:** Software Process Models - Waterfall model, prototyping model, spiral model, incremental model, concurrent development model.

**Project management Concepts:** The Management Spectrum - The People , The Product , The Process , The Project.

### Unit II

**Software Process and Project Metrics :** Measures , Metrics and Indicators , Software measurement : Size - Oriented Metrics , Function - Oriented Metrics , Extended Function point metrics

**Software Project Planning :** Project Planning Objectives , Software Project Estimation , Decomposition Techniques - Problem Based Estimation , Process Based Estimation , Empirical Estimation Models- The COCOMO Model

**Risk Analysis and Management:** Software risks, Risk identification, Risk Projection, Risk Refinement, Risk Mitigation , Monitoring and Management.

### Unit III

**Software Quality Assurance:** Basic concepts- Quality, Quality Control, Quality Assurance, Cost of Quality , Software Quality Assurance (SQA) , Formal Technical Review

**Software Configuration Management:** Baselines , Software Configuration Items, The SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting.

**Analysis Concepts and Principles:** Requirements Elicitation for Software , Analysis Principles - The Information Domain, Modeling, Partitioning, Essential and Implementation Views, Specification: Specification Principles, Representation, The Software Requirement Specification (SRS)

### Unit IV

**Design Concepts and Principles:** Design Principles , Design Concepts – Abstraction, Refinement, Modularity, Software Architecture, Control Hierarchy, Structural Partitioning, Data Structure, Software Procedure, Information Hiding , Effective Modular Design- Cohesion , Coupling

**Software Testing:** Testing Objectives & principles, Unit Testing, Integration Testing ( Top Down Integration , Bottom Up Integration , Regression Testing, Smoke Testing ), Validation Testing (Alpha and Beta Testing), System Testing (Recovery Testing, Security Testing, Stress Testing, Performance Testing).

## Unit V

**Reengineering:** Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering

**CASE Tools:** What is CASE, Building Blocks of CASE, A Taxonomy of CASE Tools, Integrated CASE Environments, The Integration Architecture, The CASE Repository.

### **Recommended Books:**

1. R. Pressman: Software Engineering, McGraw-Hill.
2. K.K. Agrawal and Y. Sing: Software Engineering, New Age International.
3. P. Jalote: Software Project Management in Practice, Pearson.

## Course ET-02B :Image Processing

### UNIT - I

Image presentation and transform : Elements of visual perception, colour representation, Image capture, representation and storage. gray level transformation, histogram equalization, multi-image operations.

Image transform : Discrete Fourier transforms (DFT), Discrete cosine transform (DCT), Walsh-Hadamard transform, Haar transform, Karhunen-Loeve transform, singular value decomposition.

### UNIT - II

Image enhancement : Contrast Intensification – linear stretching, Non-linear stretching, histogram specification, modifying gray level co-occurrence matrix, smoothing – image averaging, mean filter, order statistic filter, edge preserving smoothing, low pass filtering, Image sharpening – high pass filtering, homomorphic filtering.

### UNIT - III

Image restoration: Mean square error restoration, least-square error restoration, restoration by singular value decomposition, restoration by maximum a posterior estimation, restoration by homomorphic filtering – distortion model and range of parameter, filtering procedure and related problems.

### UNIT - IV

Image compression: Fidelity criteria, run length coding, Huffman coding, LZW, arithmetic coding, JPEG encoder and decoder , vector quantization compression.

### UNIT - V

Image segmentation : Region extraction, pixel based approach, multilevel thresholding, local thresholding, region based approach – growing, splitting, merging, split and merge techniques.

Recommended books : Digital Image processing and analysis - B. Chandra and D. Majumder  
Fundamental of digital image processing - Anil K. Jain

### **Course EP03X:Practical-I: Elective Technology Lab -II**

EP03A: Android Programming

EP03B: Microprocessor and Microcontroller Programming

These courses will be taught through practical training to develop applications using the technologies. Each student will be required to select independent applications. List of practical will be available on course web site.

### **Course EP04X:Practical-I: Elective Technology Lab -III**

EP04A: Big Data Analytics

EP04B: Cloud Computing

EP04C: Web application Projects

### **Course EP-05X**

#### **Minor Project, Elective Skill Enhancement Course II.**

**Note : Since this list is common for Semester II and III, it should be noted that a course cannot be repeated from semester to another. The student will have to opt for different courses in different semesters.**

- A. Minor Project
- B. Communication and Presentation Skill
- C. Scientific Writing Skill
- D. Statistical Analysis of data
- E. Numerical Analysis Techniques using MATLAB
- F. Campus Network Configuration & Management
- G. Big Data Analytics
- H. Cloud Computing
- I. Data Mining
- J. Financial and Accounting Tools
- K. Computer Animation

### **Course EP-06X**

#### **Elective Skill Enhancement Course III.**

**Note : Since this list is common for Semester II and III, it should be noted that a course cannot be repeated from semester to another. The student will have to opt for different courses in different semesters.**

- A. Communication and Presentation Skill
- B. Scientific Writing Skill
- C. Statistical Analysis of data
- D. Numerical Analysis Techniques using MATLAB
- E. Campus Network Configuration & Management
- F. Big Data Analytics
- G. Cloud Computing
- H. Data Mining
- I. Financial and Accounting Tools
- J. Computer Animation